vestigation into this matter might lead to a better insight into the mechanism of the swelling of gelatine. Whatever the mechanism of the change, it remains that always the greatest shrinkage subsequent swelling take place in axis perpendicular to the largest evaporating surface, regardless of the position of that surface.

In all experimentation on the absorbing capacity of gelatine it is, then, necessary to see that the following conditions prevail: (1) all the gelatine has the same original chemical composition; (2) the entire history of water-content from the time of setting to a jelly to the beginning of absorption must be the same for all the material; (3) if water loss by evaporation is to take place before absorption, then pieces or slabs of the same size and form must be used during the process; (4) if the increase is determined by the measurement of length of one dimension, then all measurements must be made on similar axes; (5) all the gelatine must have been exposed to the same temperature conditions.

TABLE III

Increase per cm. of three dimensions of rectangular blocks of gelatine (length = 0.69 cm., height = 0.15 cm., breadth = 0.30 cm.). Solution was made up to contain 33 per cent. of gelatine, poured onto a glass plate, allowed to lose water until nearly hard, cut into blocks and then allowed to absorb water. Ratios are given in brackets below percentages. Numbers refer to averages of two pieces each.

Total Time	3 Hrs.	127 Hrs.	151 Hrs.	175 Hrs.	202 Hrs.
Length . .	0.36	0.60	0.65	0.91	1.13
	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)
Height . .	1.03	1.39	1.60	1.96	1.96
	(2.9)	(2.3)	(2.7)	(2.2)	(1.7)
Breadth .	0.30	0.42	0.69	0.88	0.88
	(0.8)	(0.7)	(1.1)	(1.0)	(0.8)

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REASON FOR THE HELPFUL EFFECT OF ALCOHOLIC BEVERAGES IN DIABETES, STATES OF DEPRESSION, AND CONVALESCENCE

IN diabetes the oxidative processes are defective, as is indicated by the fact that when sugar is ingested, it is not oxidized, as is normally done, but is excreted. This defective oxidation results in the accumulation of certain incompletely oxidized substances, acid in nature, thus giving rise to a condition of acidosis which is thought by many to be the cause of coma in the later stages of the disease. Neubauer,[1] Benedict and Török,[2] Allen and DuBois have shown that the administration of alcohol and alcoholic beverages, such as wine and whiskey, facilitates the oxidative processes in diabetes, thereby enabling the diabetic to burn sugar better with resulting decrease in acidosis and sugar excretion.

The present investigation was carried out in an attempt to determine how alcohol favors or facilitates oxidation in diabetes. It is known that oxidation in the body is increased by exercise or work, by the ingestion of food, by thyroid feeding, during the excitement stage of anesthesia, and in combat, and that oxidation is decreased by decreasing the amount of work or the amount of food ingested, during deep anesthesia and in phosphorus and chloroform poisoning. We found that when oxidation was increased in the ways enumerated, there occurred a corresponding increase in catalase, an enzyme in the tissues and possessing the property of liberating oxygen from hydrogen peroxide, due to the stimulation of the liver to an increased output of this enzyme into the blood, and that when oxidation was decreased, there occurred a corresponding decrease in catalase in the blood and tissues due to the decreased output of this enzyme from the liver and utilization in the tissues. From these results it was concluded that catalase is the enzyme in the tissues principally responsible for oxidation. Furthermore, we[3] showed that the catalase of the

[1] Neubauer, O., *Münchener med. Wochenschrift*, 1906, LIII., 791.

[2] Benedict and Török, *Zeitschrift für klinische Medizin*, 1906, LX., 329.

[3] Burge, *American Journal of Physiology*, 1916, XLI., 153; 1917; XLIII., 57, 545, 1917; XLIV., 290; SCIENCE, N. S., 1917, XLVI., 440. Burge, Kennedy and Neill, *American Journal of Physiology*, 1917, XLIII., 433. Kennedy and Burge, *Arch. Int. Med.*, 1917, XX., 892.

tissues was greatly decreased in pancreatic diabetes and accordingly suggested that the defective oxidation in this type of diabetes was due to the decrease in catalase. If the defective oxidation in diabetes is due to the decrease in the catalase of the tissues and if it can be shown that the administration of alcohol produces an increase in the catalase of the tissues due to the stimulation of the liver to an increased output of this enzyme into the blood, then it would seem probable that the helpful effect of alcohol in diabetes is due to the increase in catalase with resulting increase in oxidation.

Dogs were used in the investigation. The catalase in 0.5 c.c. of the blood of the animals was determined by adding this amount of blood to 50 c.c. of hydrogen peroxide in a bottle at 22° C. and as the oxygen gas was liberated, it was conducted through a rubber tube to an inverted burette previously filled with water. After the volume of gas thus collected in ten minutes had been reduced to standard atmospheric pressure, the resulting volume was taken as a measure of the amount of catalase in the 0.5 c.c. of blood. The material was shaken at a fixed rate of one hundred and eighty double shakes per minute during the determinations.

Twenty-five c.c. per kilo of body weight of 45 per cent. ethyl alcohol were introduced into the stomachs of the animals by means of a stomach tube. Previous to as well as at 15-minute intervals after the introduction of alcohol, the catalase in 0.5 c.c. of blood taken from the external jugular was determined. Fifteen minutes after the introduction of alcohol into the stomach, it was found that the catalase of the blood was increased by about 30 per cent., after 30 minutes by about 50 per cent., and after 45 minutes the catalase of the blood of some of the dogs was increased by as much as 100 per cent.

After etherizing other dogs the abdominal wall was opened and the catalase of the blood taken directly from the liver or from one of the hepatic veins as well as from the jugular was determined. It was found that the blood from the liver was richer in catalase by ten to fifteen per cent. than the blood from any other part of the body. This was taken to mean that there is a continuous output of catalase from the liver into the blood and that this catalase is taken to the tissues to be used presumably in the oxidative processes. After the introduction of the alcohol into the stomach of the animal, it was found that the catalase in the blood taken directly from the liver was increased much more rapidly than that taken from a systemic vein such as the jugular, hence the alcohol must have been stimulating the liver to an increased output of catalase and in this manner producing an increase in the catalase of the blood and hence of the tissues.

Alcohol was also administered to dogs rendered diabetic by the removal of the pancreas, and it was found that the catalase of the blood and hence of the tissues of these animals was increased. It is probable that the helpful effect of alcohol in states of depression and in convalescence as well as the exhilarating effect on normal subjects is due to the stimulation of the liver to an increased output of catalase with resulting increase in oxidation.

The conclusion is drawn that the administration of alcohol to diabetics is helpful because it stimulates the liver to an increased output of catalase which is carried by the blood to the tissues where it facilitates the oxidative processes with resulting increased oxidation of sugar and decreased acidosis.

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